Maple Leaf Mews
Kingston 10
JAMAICA

Manual of Pressurized Solar Water Heater

This manual applies to Model ThermoPower-VTS30HP and ThermoPower-VTS30HP-E

ñThe solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the SRCC. This certification does not imply endorsement or warranty of this product by SRCC.ò

The supplier's name: SunMaxx Solar [tm].

Address: Maple Leaf Mews, Kingston 10

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All the system labels will be packaged with the product when shipment and all of them were made of weather proof material. Some of them must be attached to the valves with plastic or wire tie after installation. If the label is lost or damaged for some reason, type a new one on heavy paper stock and seal in clear plastic to make it water proof. 31
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IMPORTANT INFORMATION AND WARNINGS

Safety & Regulatory information

DO NOT operate this system before reading the manufacturers' instructions.

This appliance must be installed, commissioned and serviced by an authorized person in accordance with all applicable local rules and regulations.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

For continued safety of this appliance it must be installed, operated and maintained in accordance with the manufacturersô instructions.

Children should be supervised to ensure they DO NOT play with the appliance.

Prevent from burn injury, touching the heat pipes in the glass tubes is strictly prohibited. The evacuated tubes are not allowed to be exposed under the sunshine directly before installation.

Care should be taken not to touch the pipe work as it may be HOT! Plastic pipe is NOT suited to the water temperature and pressure that may occur in the system.

DO NOT store chemicals or flammable materials neat the appliance.

NEVER use a flammables spray such as hair spray, lacquer, paint, etc. near this unit as this may cause a fire.

The domestic solar water heating systems will reduce your energy bill and protect our earth by cutting the carbon footprint. SRCC published the system performance at different location of the United Stated. You can refer to the report or certificate for the details of the energy saving.

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SOLAR WATER HEATER PACK AND TRANSPORT

All ThermoPower-VTS30HP and ThermoPower-VTS30HP-E appliances (storage tank, evacuated tube, support base and connection accessories), are delivered well packed to the customer.

The storage tank is placed between two round Styrofoam covers of 7 cm each, which are tightened on the storage tank with stretch film. Then it is placed in a hard carton pack, on which the indications of each model are displayed on the outside. The frame and reflector are fixed beside the tank in the same box.

The evacuated tube with heat pipe and aluminum fin is packed with 4 plastic protective elbows, attached on 4 different positions of the tube. One box can store 15 or 10 pics tube, and then packed in a wooden box.

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1. Features of pressurized solar water heater

ÅHigh food grade stainless steel 304 2B. State of-the-art welding and achieves potable water status.

ÅThrough the 365 degree inner tube absorber, reflectors behind the tubes, the heat up time is very fast from the time the sun rises on the east side of the tube until it goes down on the west side ï unlike flat plate, which has a high output during the sunôs highest energy, around midday.

ÅUtilization all year round, even in cold, windy climates where freezing does not occur below -2 degrees Celsius for short periods of time.

ÅCan operate with incoming water pressures of 0.4 MPa ï no circulating pump or controller necessary.

ÅThe system will still function if some vacuum tubes lose their vacuum or are accidentally damaged.

ÅAll day tracking capabilities due to 360 degree absorber on inner tube.

ÅThe diffuser reflector plate behind the glass tubes adds to the heat gain during blue sunlight days.

ÅWhen consisting of more than one unit, can be installed using parallel and/or series connections, increasing the hot water capacity supply.

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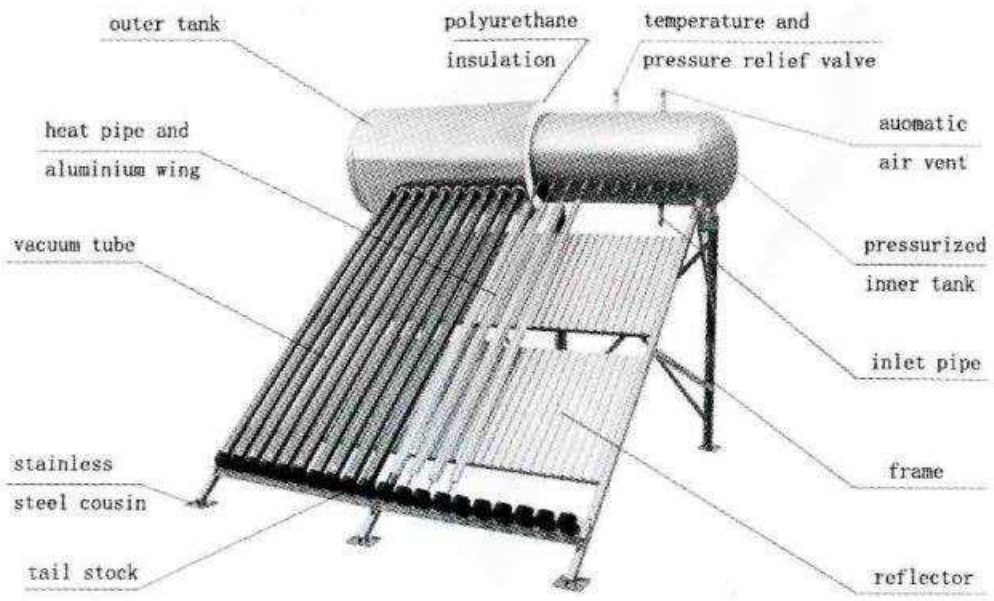
2. Structure of solar water heater



Component description:

HEAT PIPES: An evacuated-tube collector contains several individual glass tubes, each containing an aluminum fin and a heat pipe. The heat pipe transfers the heat efficiently to the water in the tank.

WATER TANK: The storage tank is made of three layers: inner shell, intermediate foam insulation and outer cladding. The shell is built to hold water pressure maximum of 150psi. Shell material is corrosion-proof food-grade stainless steel. Foam insulation thickness is decided to maintain the tank water temperature self-sustainable during continuous unclear days in the coldest wintertime. Outer cladding is normally galvanized sheet metal, providing a fine surface finish and a long-lasting life.

EVACUATED TUBES: Top quality double-walled tubes are chosen. There is an aluminum or copper coated mirror on the inside surface of the inner glass wall. The mirror well traps the thermal energy inside the tube. On the metal mirror layer, there is selective absorption coating, which converts over 99% energy of visible and invisible lights.

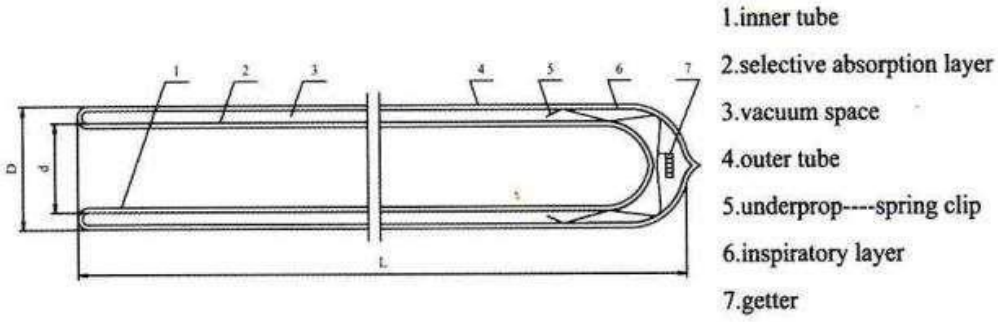
The outer glass wall acts as glazing, creating a vacuum space and protects the coating against weather. On the inner surface of tube ends, a silver-colored getter material is applied, which absorbs the remaining gases inside the tube hollow space. Deducting the absorption and surface reflection of the outer wall of a tube, the overall efficiency of a tube is over 92%.

REFLECTOR: Reflector is silver coated reflecting panel. The reflectors can improve solar system thermal efficiency and reinforce the frame structure.

FRAMES: Frame is made of rustproof material. A frame may have full-length rear legs, suitable for flat surface installation, or, shortened rear legs, suitable for sloped surface installation. Length of rear legs could be cut to fit at site.

3. Working principle

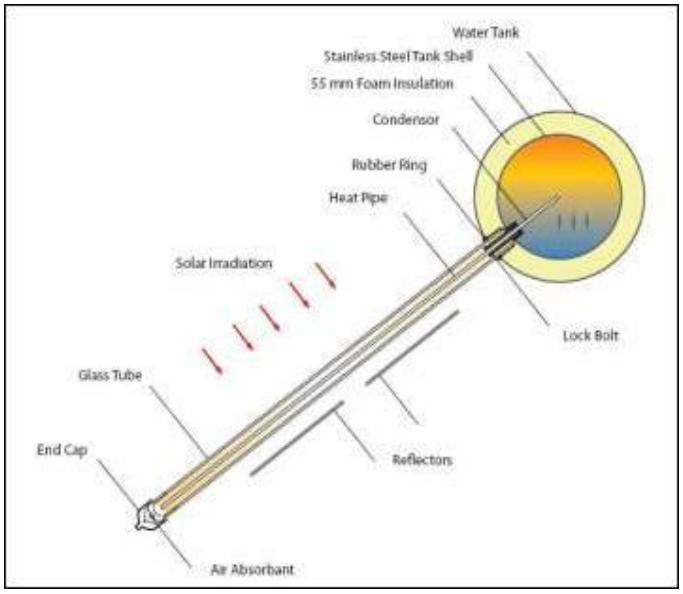
3.1. Principle of vacuum tube



The vacuum tube is composed of inner tube, outer tube, selective absorption layer, vacuum space, inspiratory layer. The outer wall of the inner tube is the selective absorption layer. The space between outer tube and inner tube is the vacuum space. At the bottom of the outer tube, there is an inspiratory layer which can be used to absorb the remnant air.

3.2. Working principle of solar water heater

The vacuum tubes absorb the solar energy, and aluminum fin pass the heat energy to the heat pipe. The liquid medium in the heat pipe is heated by the heat energy, and then turns into the gas medium. The gas medium flows up to the top of the heat pipe and transfer the energy to the cold water in the tank, at the same time the gas medium turns into the liquid one and flows down. The liquid medium keeps recycling and the water in the tank will become hot.



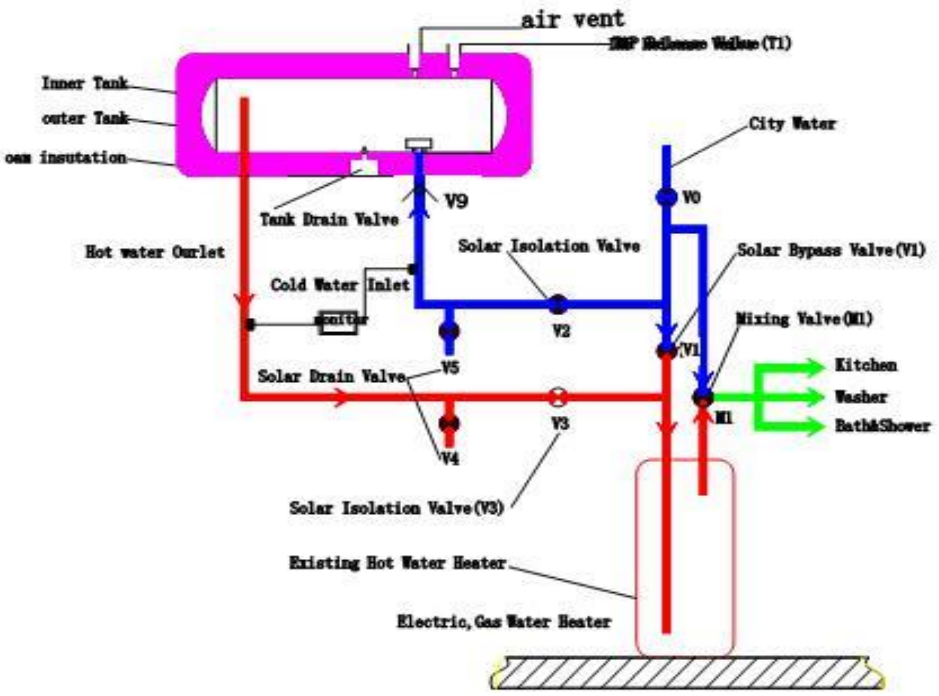


Fig 3.1 Solar water heater working sketch map

4. Technical data and product description

4.1 Technical data

Model	ThermoPower-VTS30HP
Number of Tubes	30
Gross area	4.45m^2
Tank Volumetric Capacity	300L
Weight Empty	90Kg
Fill weight	330Kg
Length of Tubes	1800mm
Outer tube diameter	Ø58mm
Tube thickness	1.6mm
Tube Thermal Expansion	3.3×10^{-6} m/m°C
Absorptive coating	Graded Al-N/Al
Absorbency	>92%(AM1.5)
Emittance	7%(100°C)

Vacuum	P<0.005Pa
Heat Loss	<0.8W/㎡
Insulation	Polyurethane,55mm
Stagnation Temperature	<220℃
Maximum working temperature	90℃
Maximum Working Pressure of all circuits	0.6MPa
Working pressure	0.4MPa
Maximum wind and snow load	0.49kN/m²
Tilt Angle	45°
Inlet and Outlet	1/2inches
T&P Valve Port	1/2 inches
Frame	Aluminum Alloy

4.2 System Tolerance Information

Freeze tolerance limits are based upon an assumed set of environmental conditions. Extended periods of cold weather, including ambient air temperatures above the specified limit, may cause freezing in exposed parts of the system. It is the ownerôs responsibility to protect the system in accordance with the Supplierôs instructions if the air temperature is anticipated to approach the specified freeze tolerance limit.

4.3 System start-up procedures

After the system installation, check there is no leakage in the system and follows the following steps to start up the system.

Step 1: Connect Garden Pipe to Drain Valve V4, and keep V4 Open.

Step 2: Open the following valves: V0, V2, V4 and shut off the following valves: V1, V3, and V5

Step 3: Keep the water running for 5 minutes to flash out the solder or stains after the water from V4 is observed.

Step 4: Shut off V4 and Open V3, and the system is in normal operating status.

4.4 System pipe anti-freezing protections

This is a direct DHW system. The plumbing copper pipe needs anti-freezing protection when the lowest temperature is below 23 Fahrenheit or -5 Celsius in the coldest climate. The detail anti-freezing protection is described as follows.

The tables SRCC uses to evaluate the freeze protection provided by pipe insulation indicate that 1.5 inches of insulation on a 0.75 inch type L copper pipe will protect the pipe down to about 14F. It would be ok for the whole system if the entire pipe was insulated well under this temperature condition.

It would be better to drain down the whole system if the temperature is lower than 14^{O}F to avoid the connecting pipe freezing. The connecting pipe can be protected against freeze damage.

In case of black out or power outage occurs during the cold weather when the temperature is lower than 14 Fahrenheit or -10 Celsius, a system drain out procedure must be followed as follows, and the existing Aux water heater must have adequate capacity, listed and labeled by an accredited listing organization to continue provide adequate hot water.

Step 1: Shut off V2 and V3 Solar Isolation valves to Isolate Solar System.

Step 2: Open V1 to using Aux hot water heater system, and bypass the solar water system. Ensure the V0 is open.

Step 3: Connect Garden Pipe to both Drain Valve V4 and V5.

Step 4: Put the both Garden Pipes in the house drain dock or sinks.

Step 5: Open both V4 and V5 drain valves, until no more water comes out of either pipes.

Step 6: Shut off both V4 and V5 drain valves.

When the electricity power is back to normal, follow the system start-up procedures to set up the system to normal operation.

4.5 Specific notices

4.5.1 Aux Hot Water Heater

The system is not a replacement of the existing Aux Hot Water Heater. It is installed at the upstream of the existing conventional hot water heater. The Aux Hot Water Heater must be maintained as usual. The Aux water heater must have adequate capacity, listed and labeled by an accredited listing organization. The Aux water heater should have the proper built in insulation by the accredited organization. If the Aux Water

Heater doesnôt come with the insulation, it should be covered with a minimum R2.2 insulation with thickness of 1/4ò. (GUIDE: 6.1.1.4)

4.5.1 Different metallic materials

To prevent galvanic corrosion, a dielectric union or coupling is recommended to install in between the copper pipe and steel tank. (GUIDE: 6.1.1.10)

4.5.2 System Tank (GUIDE: 6.1.3.2)

The direct system comes with 63 gallons tank and no heat exchanger, hence no extra tank is needed.

4.5.3 Heat Transfer Fluid (HTF) inside the heat pipe (GUIDE: 6.1.3.6 and 6.3.7)

The HTF inside the heat pipe is a small amount of pure water at a very low pressure. The heat pipe, HTF are built as one unit, no refill is needed, and the water inside will not be reduced.

No other fluid shall be used that would change the original classification of this system. Unauthorized alterations to this system could result in a hazardous health condition.

4.5.4 Temperature Sensor Wiring and System Monitoring (GUIDE: 6.1.5.5 and 6.4.1)
Connect each of the temperature sensors with the cold water pipe and hot water pipe respectively. Put one-foot R4.4 insulation on both sensors. The sensor and pipe intersection point should be in the middle of the one foot insulation.

To determine whether the solar system is working, observe the thermometer when the hot water is being used in the house. The water returning from the collector on a sunny day should be at least 10 Fahrenheit warmer than the water going up to the collector. The temperature of the cold water and hot water is displayed on the monitor.

4.5.5 The insulation of the final 5 feet to the auxiliary water heater (GUIDE: 6.1.6.3)

The insulation of the final 5 feet to the auxiliary water heater shall be insulated with R-0.46 K m^2/W or greater insulation.

4.5.6 Public Traffic Statement (GUIDE: 6.3.17)

Components exposed to public traffic should be maintained below 140°F or insulated/isolated to prevent any hazards to the public traffic.

4.5.7 Components accessibility (GUIDE: 6.4.6)

All components should be accessible for maintenance and servicing.

4.5.8 Installation and Maintenance Practices (GUIDE: 6.5.5 and 6.5.10)

Do not impair enclosure function. Do not allow vermin intrusion. Ensure to meet applicable codes and national Roofing Contractors Assoc. practices. The entire system should be checked by the installer once every two years.

Follow the specific codes and practices to penetrate the structural members for the solar system.

4.5.9 Safe practices (GUIDE: 6.5.11)

Building materials adjacent to solar components are not exposed to elevated temperatures.

4.5.10 System mounting (GUIDE: 6.5.12, 6.5.13, 6.5.14 and 6.5.19)

Allocate a place is not shaded during 10:00AM to 3:00PM, and keep the solar panel facing south with 45 degrees of adjustment tolerance. The pitched degree of the panel should be close to the latitude of the location.

All the piping should proper support according to the plumbing codes. These supports must not compress the insulation.

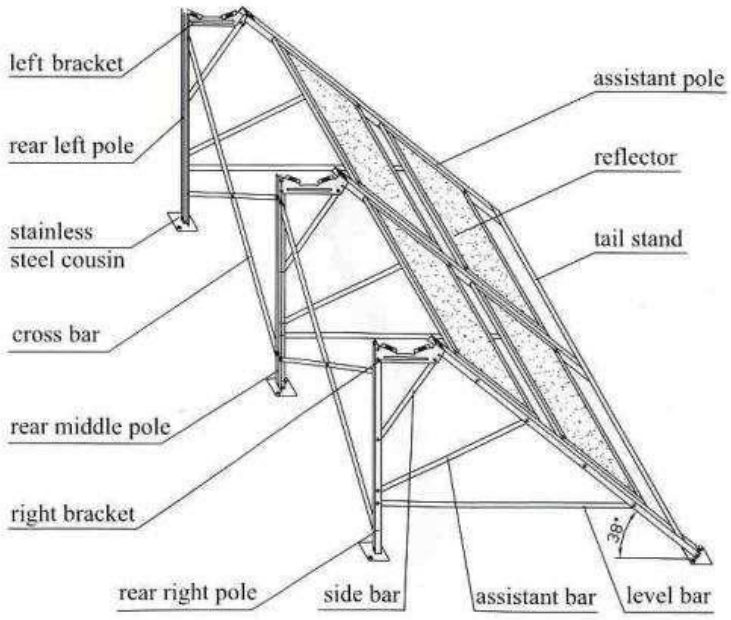
Any structural member or fire rated assembly should not be reduced after penetration during the installation. It will be up to the local code to dictate exactly how this is done. The outdoor pipes should be insulated with R6.6 insulation with thickness at or greater than 1 inch. The indoor pipes should be insulated with R2.6 with thickness at least 1/4ò.

4.5.11 Projected components need to be replaced

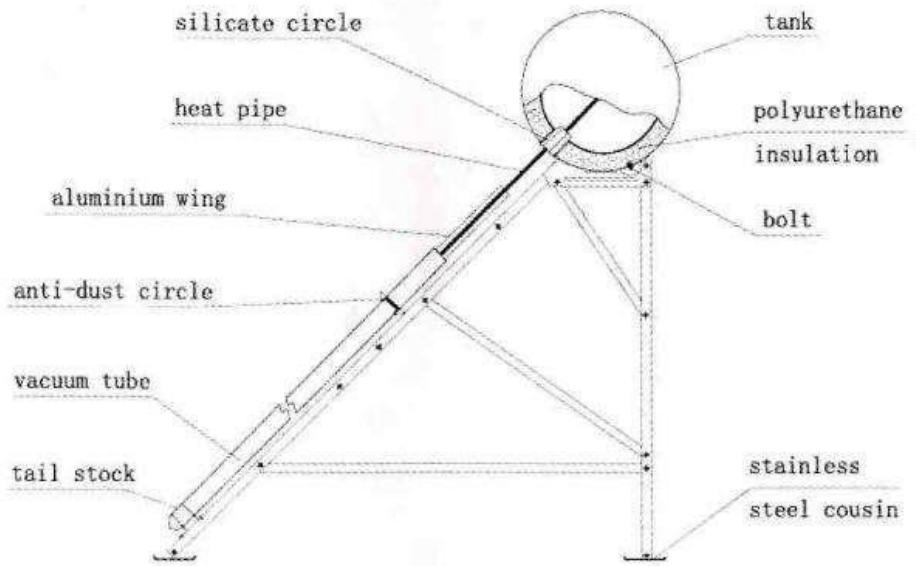
The glass vacuum tubes might need to be replaced after it is broken by the unexpected hazards, such as hit by the hard material. Please contact to the installer to order the parts and do the replacement. The battery of the temperature monitor needs to be replaced when the battery is out. The battery can be purchased at store.

5. Installation of solar water heater

5.1. Frame installation drawing



5.2. Water tank and vacuum tube assembly drawing



5.3. Solar water heater assembly step

5.3.1 Installation of frame:

Firstly, open the packing case to check the fittings related with the frames and their quantity. They include front and rear legs, assistant bars, cross bars, tank brackets, tail stock track, tail stocks, reflectors, cousins as well as screw bag.

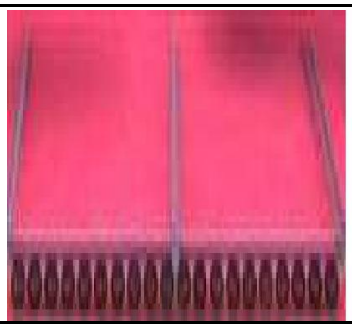
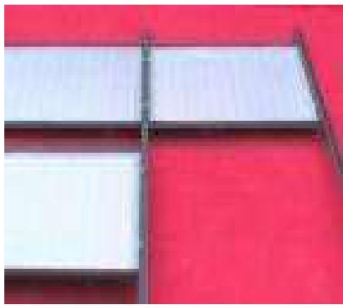
	

Fig 1	Fig 2

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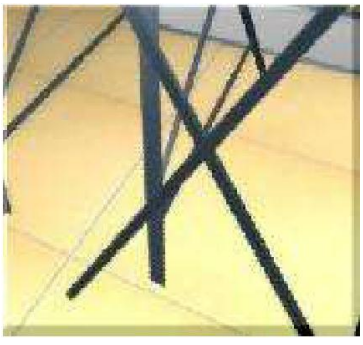
Step 1. Take the tail stock track out and put it under the frame. Open the screw bag, finding the bolts that match the connecting holes to connect the tail stock track with front legs.	**Step** 2. Take the reflectors out and connect them with front legs by bolts and nuts. Attention: the reflector near to the tail stock track should not be installed now so as to operate more easily in the installation of the rear legs and assistant bars.
Fig 3	Fig 4
Step 3. Find the tank brackets and connect them with rear legs. **Attention: The installation of the three tank brackets is the key point; observe carefully so as to avoid the faulted installation.**	**Step 4.** Take the rear side legs out and connect them with the corresponding connecting holes of the tank brackets by bolts. Observe carefully how the rear side legs are collected with the tank brackets.
	
Fig 5	Fig 6
Step 5. Connect the front legs with rear legs by assistant bars, pay attention to the length order of assistant bars. Take	**Step 6.** Take the cross bars out that are used to fasten the rear legs, group them together first. Connect the cross bars

the rear middle leg out and connect it with the tank brackets. **Attention: Put two angle irons together as the rear middle frame and then connect them with the tank brackets.** The assistant bars are collected with the reflectors by the same screw. Take the last rear leg out and connect it with the tank brackets. Then use the assistant bars to connect the rear and front legs in the same way mentioned above.	with the two adjacent rear legs. The cross bars can fasten the rear legs well for fear that the strong wind destroys the frames.
Fig 7	Fig 8
Step 7. At last connect the cousins to the corresponding front and rear legs.	**Step 8.** Turn the frame over and put it on the ground at the installation angle between the front legs and rear legs.

5.3.2 Installation of the tank:

Fig 1	Fig 2	Fig 3
Step 1. Screw off the nuts from the connection bolts of the water tank. Take the water tank out. Put it on the well-installed frames slowly and lightly. **Attention that insert the bolts of the water tank into the corresponding connecting holes of the tank brackets.**	**Step 2.** Install the accessories and revolve the small red cap of the air vent on the top to ventilate. .	**Step 3.** Install the T.P valve.

5.3.3 Installation of the heat pipe and vacuum tubes

Step 1. Firstly sheathe the anti-dust circles onto the vacuum tube.

Step 2. Take the adjustable tail stocks down.

Step 3. Pull the heat pipe out of the vacuum tube about 20 centimeters.

Step 4. Sheathe the white Teflon gasket into the heat pipe and put it onto the convex of the copper circle.

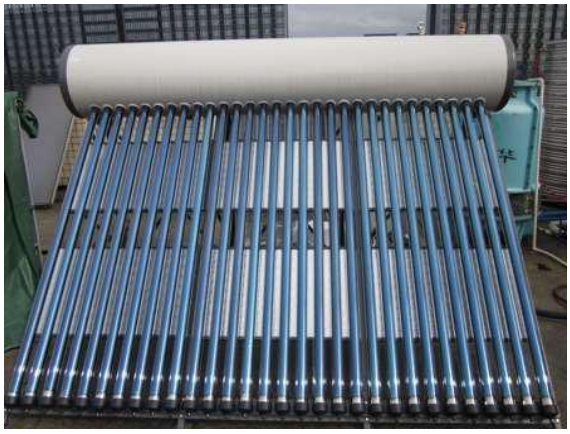
Step 5. Put the heat pipes into the water tank slowly. **Attention: If it is not easy and convenient to do, we can adjust the angle between the water tank and the ground properly.**

Step 6. Connect the joint screw with the nuts inside the water tank and screw them tightly by 22mm spanner. Please pay attention to the tightness extent, avoiding being too loose to cause water leakage.

Step 7. Install all the heat pipes according to this method. Adjust the angle and the inappropriate places, keeping them horizontally. Then charge water into the tank to check if there is a leakage from the connections.

Step 8. Insert the vacuum tube into the anti-dust circle of water tank, and then install the tail stocks that have been taken down. **Attention: when inserting the vacuum tubes, they cannot be revolved for fear that they destroy the heat pipes.**

At last fasten all the screws.



5.3.4 Solar water heater installation and attention

This STEP requires you to locate your hot water heater. The collector should face approximately South (plus or minus 20°). Use a declination value from a map or declination table to determine the direction of true South from the compass reading.

The collector should be tilted at the latitude angle plus 15° for best winter operation and latitude minus 15^{o} for best summer performance. Tilt at latitude for best year round performance.

A good GPS will also provide accurate compass headings and your exact latitude. If you do not have a compass or GPS, wait until solar noon and the shadow of a vertical stick or surface will point due North. True South is 180° from true North. HINT: MANY SOLAR SYSTEMS ARE PLACED AT THE ROOF SLOPE WHICH IS LESS THAN LATITUDE MINUS 15°, BUT IS MORE AESTHETICALLY PLEASING, WITH ONLY A SMALL 10% PENALTY IN ANNUAL PERFORMANCE.

The latitude of your location can be found on the Internet or in your local paper. The latitudes of some selected U.S. cities are presented in Table 5-1 for reference. (HINT: Look at other solar collectors in your area, see how they are oriented to South and elevated for latitude) .The report includes a solar sitting template to show the effects of shadowing from trees or nearby buildings, declination map and other useful information about system sitting.

Table 5-1 Approximate Latitudes of Selected U.S. Cities

City (arranged by increasing latitude)	Latitude (all North)
Anchorage, AK	62°
Juneau, AK	58°
Seattle, WA	47.5°
Portland, OR; Minneapolis, MN; Bangor ME	45°
Buffalo, NY	43°
Chicago, IL; Boston, MA; Detroit, MI	42°
Denver, CO; Indianapolis, IN; Philadelphia, PA	40°
Kansas City, MO; St. Louis, MO; Washington, DC; Cincinnati, OH	39°
Reno, NV	39.5°
San Francisco, CA; Sacramento, CA	38°
Nashville, TN	36°
Albuquerque, NM; Memphis, TN	35°
Los Angeles, CA	34°
Phoenix, AZ; Charleston, SC	33°
San Diego, CA; Savannah, GA	32°
Houston, TX; New Orleans, LA; Jacksonville, FL	30°
Tampa, FL	28°
Brownsville, TX; Miami, FL	26°
Honolulu, HI	21°
Hilo, HI	20°

Three reference poses are given below. However, in deciding the specific location and pose of a unit, the installer should consider:

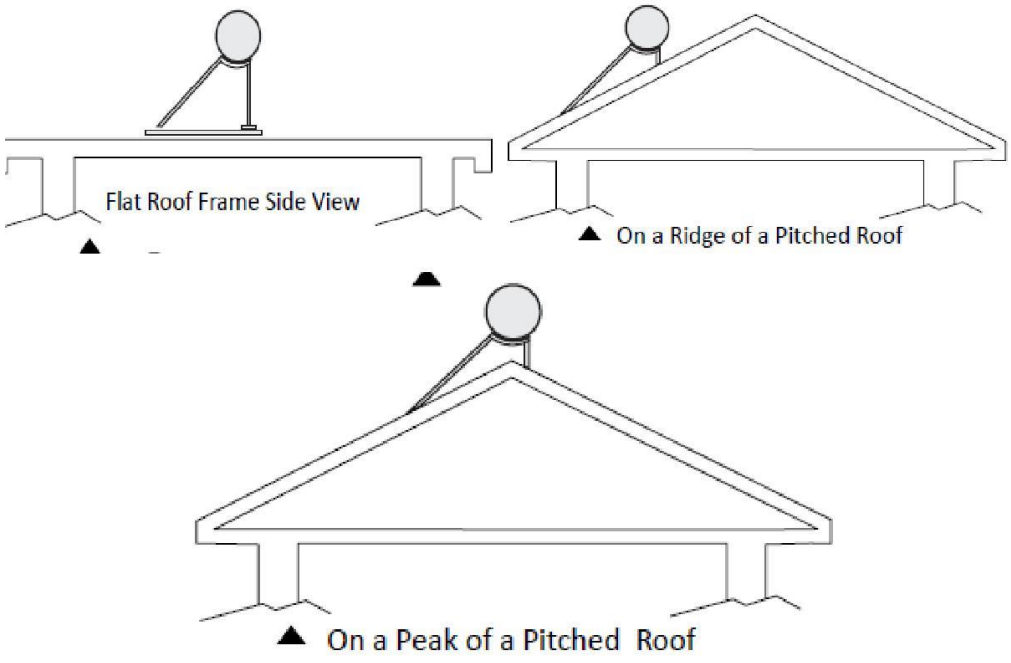
1) Choose the strong foundation and safe place

2) Take a location with optimized sunshine exposure

3) Minimize plumbing length for decreasing heat loss

4) Ensure the aesthetic view with the surrounding environment

5) Perform safe operations to prevent from injury during installation.



- The solar water heater must be installed in locations with wind and snow load lower than 0.49kN/m². If the wind and snow load in the locations more than this value, please strengthen the installation of system.
- The best time to install the heat pipes and vacuum tubes is in the morning or in the evening or the time when the sunlight is weak. If there are strong sun lights, the heat pipes will be heated quickly and the temperature will reach above 100 degrees. That will scald the installation workers easily. Or wrap the vacuum tubes by a piece of cloth so that they are not exposed under the sun lights directly.

- After installing and adjusting solar water heater, connect cousins with building plate by the inflated bolt. Fix it more than 4 steel ropes to avoid the demolishment from the strong wind.
- Be sure that no leakage in pipeline, joints, valves and etc.
- The pipeline outside must be dealt with heat preservation and anti-freezing. In some special cold area, the emptier or restrained temperature anti-freezing cable should be added.
- If the solar water heater is not in the protecting scope or lightning conductor fixed in the buildings, the user should add the lightning conductor. The local power department must connect the roof conductive part to the ground wire with at least 16 mm grounding cables. For building height (installation height) less than 20 meters, do not need to adopt the special measures to protect lightning strikes
- When penetrations are required in structural members to accompany passage of solar components, those modified structural members shall comply with local building codes.
- Building materials adjacent to solar equipment shall not be exposed to elevated temperatures which could accelerate their deterioration. Many non-metal roofing materials will soften in the temperature range of ---and begin to degrade above this temperature.
- The design and installation of systems shall not impair emergency movement of the building occupants.

The installation shall:

- NOT IMPAIR ENCLOSURE FUNCTION
- NOT ALLOW VERMIN INTRUSION
- MEET APPLICABLE CODES AND NATIONAL ROOFING CONTRACTORS ASSOC. PRACTICES.

6. Pipeline installation

6.1 plumbing system schematic map

ThermoPower-VTS30HP is a solar thermal hot water heater system which pre-heats city water with solar energy prior to feeding to the conventional hot water heater. It can be integrated with the existing gas, electricity, propane or oil hot water heater by installing at the upstream of the existing hot water heater. Food grade materials should be used for all water contact areas.

A mixing valve must be installed if the homeowner does not have one currently. Set the output water temperature at a point of 48.9^{o}C (120^{o}F).

The tank upper temperature limit is 300^{o}F and 130 psig. As the thermosiphon system has no way to stop the operation of the solar collector, always install a TP-R valve to release some high temperature water out of the tank then mains water will charge the tank to keep the tank within normal conditions.

The T&P valve releases some water out of the tank when the temperature is more than 194°F, or the water pressure is above 58 PSI to ensure the safety of the system. And the specification of the TP-R is:

- Inlet:1/2 in tapered male thread
- Outlet:1/2 in parallel female thread
- Maximum opening temperature:90℃/99℃
- Rated working pressure: 0.4MPa/0.6MPa
- Maximum working pressure：1.5MPa

If you have a long time to go out of your home, and the system will not be used during that period, we recommend you drain down the system and close the inlet valve to avoid overheating. And in order to prolong the system use life, you had better to cover the collector using a canvas clothes a mat.

When the tank gets too hot as some irrationality actions, please drain down some hot water and then charge the mains water to cool down the system slowly.

All exposed areas need to be well insulated to resist freezing. The well insulated tank keeps the hot water in the tank from losing too much energy through the night. The system can absorb energy at most of the weather conditions even at full cloudy day in the cold winter. The collector tubes can still get energy from infrared passing through the clouds at full cloudy day.

All labeled valves (V1 to V5) must be installed at an adultôs reachable place. Draining valves (V4 & V5) must come with hose bibs that can connect a garden hose for draining purpose.

Piping should be sloped toward drain ports with a drainage slope of no less than 2 cm vertical drop for each meter of horizontal length (1/4 inch per foot).

The illustration is the installation pipe line of pressurized solar water heater. The directions of each valve and the corresponding positions should be correct. There should be no leakage in the tie in. The pipe line must be dealt with heat preservation and anti-freezing.

Underground piping subject to vehicular traffic shall be installed to withstand the additional loading applied by this traffic. The trenches and backfill shall be free of sharp objects in contact with the pipe.

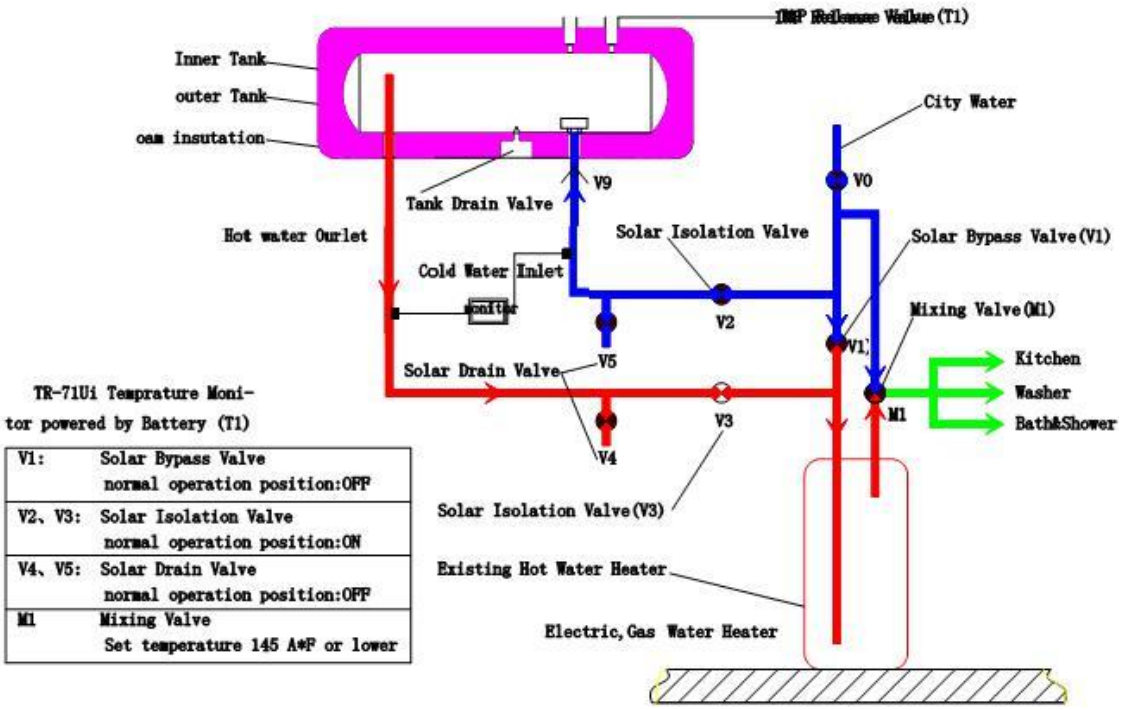
As the system is a solar only system, there will be some days that it cannot meet the user heat demand if the solar irradiance is not ideally. It requires an aux water heating equipment to ensure that all the days can meet the user demand.

Our system can plumb with electrical, gas or oil water heater, the detail connecting please reference the below diagram. Please note that, when you choose the backup water heater,

ñTHE AUX WATER HEATER MUST HAVE ADEQUATE CAPACITY, LISTED AND LABELED BY AN ACCREDITED LISTING ORGANIZATION.ò

The backup water heater thermostat set point can be 51.7°C (125°F) to meet the final delivery water temperature.

Regarding the electrical back up water heater, you can choose to connect both of the heat elements to speed up heat rate, or you can only connect one on the top of this water heater. It would be better to get some suggestions from the field-wiring installer to ensure all the wire can meet the heat element maximum power.



The above is a reference plumbing connection diagram. The formal plumbing architecture design and blueprint drawing shall always be done by a licensed architect and signed by licensed plumbers. Acquire the proper working permits from the local city building department before the installation. Install the system by a licensed contract with solar install certificate. Request and perform the inspection and sigh-off after installation.

Important Notice and Warnings

Prevent from burn injury, toughing the heat pipe in the glass tubes is strictly prohibited. The evacuated tubes are not allowed to expose under the sunshine directly before the installation.

The inlet and outlet port size is 1/2ò tube, you can choose the pipe size between the water supply and water tank connections can be 1/2ò or 3/4ò. And the safety valve size is also 1/2ò. Make sure all the safety valves are in normal condition before flushing the system.

The temperature monitor and sensor shall be installed suitably to ensure the system can work normally. There are two recommended methods to install temperature sensor into the inlet and outlet pipe.

Method 1, use a three way valve and sensor pocket to install the temperature sensor at the inlet and outlet port of the water tank.

Fig1. sensor pocket	Fig2. the top end of the sensor pocket	Fig3. sensor pocket connect with three way valve

It would be better to install the sensor at the inlet and outlet port of the tank to measure the temperature accurately.

Method 2, if the sensor pocket is not available when install the system, you can choose an easier method to install the temperature sensor.

step1. Put the temperature sensor close to the inlet and outlet copper pipe. Keep them contact tightly.	Fig2. Use duct tape to fix the sensor.	Fig3. Then insulate the whole pipe with PU foam.

The sensor shall be install as close as possible to the inlet and outlet port of the tank and insulate well.

After install temperature sensor, the sensor wiring shall go through the pipe to get into the house，and then connect with temperature monitor. The monitor shall be installed in a place where can be monitored expediently and keep it dry.

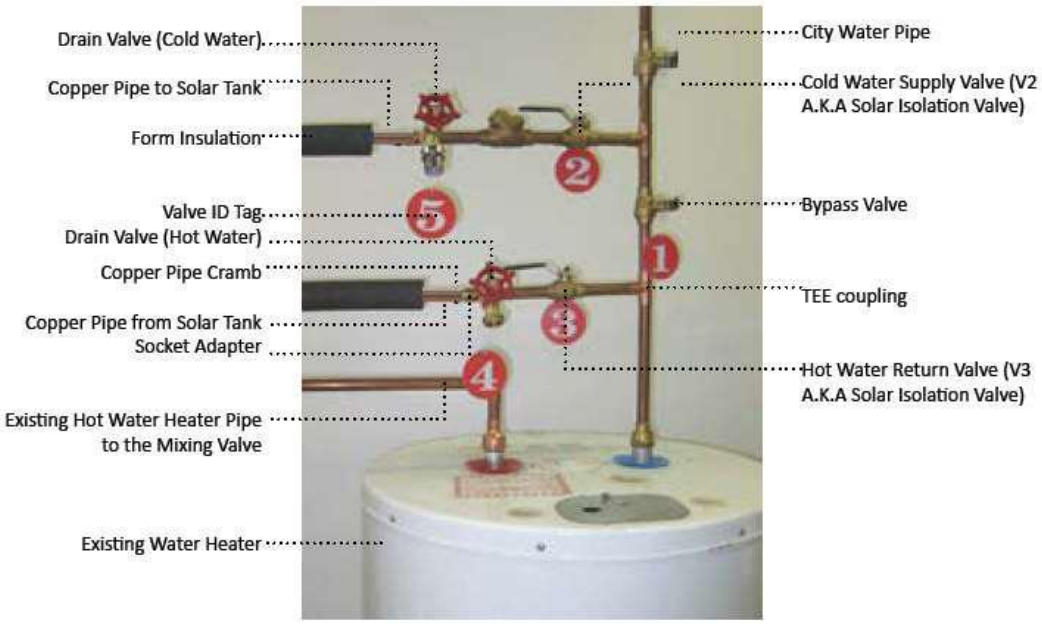
The recommended temperature monitor SmartMaxx-DHWV2 can be installed expediently, and you just need fix the monitor onto the wall and insert the thermal sensor connector into the sensor jack of the monitor. You can refer the monitor diagram below.

To determine whether the solar system is working, observe the thermometer when the hot water is being used in the house. The water returning from the collector on a sunny day should be at least 10 Fahrenheit warmer than the water going up to the collector. The temperature of the cold water and hot water is displayed on the monitor.

The monitor main unit shall work normally under the ambient temperature between -10 and 60°C, the humidity under <90%RH. The thermal sensor shall meet the working temperature between -40-110°C. The recommended measure accuracy is 0.1°C.

If the solar water heater is installed either on a metal roof or in a trafficable area, such as on an accessible roof, then the solar hot and solar cold pipes must be insulated. The solar hot and solar cold pipes may be required to be insulated to comply with local regulations.

6.2 plumbing connections



Components list and Valve labels

ID	Name	Normal operation position	Model/technical specification	Photo	Quantity
V0	City water shut off valve	ON	3/4ò ball valve		1

V1	Solar Bypass valve	OFF	3/4ò ball valve		1
V2	Solar isolation valve	ON	3/4ò ball valve		1
V3	Solar isolation valve	ON	3/4ò ball valve		1
V4	Solar Drain valve	OFF	3/4òDrains hose outlet connection with NPT threaded inlets		1
V5	Solar Drain valve	OFF	3/4òDrains hose outlet connection with NPT threaded inlets		1
V6	Mixing valve	Set temperature 48.9oC	1/2" WATTS series 70A Tempering Valve (120°F-160°F) temperature range: 120+F to 160+F. Maximum Pressure: 150psi (10 bar). Size Range: 1/2 to 3/4 in. (15 to 20mm)		1
V7	TPR valve	Normal operation condition	WYA-15 1/2ôô Meet ANSI Z21.22 Inlet:1/2 in tapered male thread Outlet:1/2 in parallel fe male thread		1

			Maximum opening temperature:90℃/99℃ Rated working pressure: 0.4MPa/0.6MPa Maximum working pressure：1.5MPa		
V8	Air vent valve	OPEN	R99Y		1
V9	No-return valve/check valve	OPEN	Maximum operating pressure 400psi		1

Connections list

ID	Name	Material	Model	photo	requirements
Connection 1	Fluid loop Tube	Cooper	3/4ôô		Materials shall meet the standards of the national sanitation foundation
Connection 2	3/4" CxCxC Tee and Couplings	Cooper	3/4ôô		Materials shall meet the standards of the national sanitation foundation

Connection 3	3/4" Copper x Female Adapter	Cooper	3/4ôô		Materials shall meet the standards of the national sanitation foundation
Connection 4	3/4" x 1/2" Copper x male Adapter	Cooper	3/4" x 1/2"		Materials shall meet the standards of the national sanitation foundation

ID	Front label	Back Label
V0	City water shut off valve. Shut this valve will shut the water supply for the solar and Hot Water System. Normal operation position: OPEN	City water shut off valve OPEN V0
V1	Solar Bypass Valve Normal Operation Position: CLOSE	Solar Bypass Valve CLOSE V1

V2	Heat transfer fluid identity and AWWA class 1 warning that fluid may be discharged at high temperature and/or pressure. Unauthorized alterations to this system could result in a hazardous health condition	Solar Isolation Valve OPEN V2
V3	Heat transfer fluid identity and AWWA class 1 warning that fluid may be discharged at high temperature and/or pressure. Unauthorized alterations to this system could result in a hazardous health condition	Solar Isolation Valve OPEN V3
V4	Solar drain valve is used to drain the solar system. Normal operation position: CLOSE	Solar Isolation Valve OPEN V4
V5	Solar drain valve is used to drain the solar system. Normal operation position: CLOSE	Solar Isolation Valve OPEN V5

All the system labels will be packaged with the product when shipment and all of them were made of weather proof material. Some of them must be attached to the valves with plastic or wire tie after installation. If the label is lost or damaged for any reason, type a new one on heavy paper stock and seal in clear plastic to make it water proof.

- The freeze protection label must be attached to the water tank drain valve.
- Hot warning label must be attached to the position where the mix-valve is installed.
- The system label will be attached on the front side of the tank.
- And the valve V0-V5 label must be attached or hang on the valve which installed according to the diagram in this manual.

6.3 Insulate the pipe

For the installation of the pipeline system and power cord (including indoor and outdoor parts) of the flat solar system, the pipeline shall go through the airway of the house, and should not be installed in the flue; the indoor part shall be open line and shall not bury the pipeline of the solar system and power cord in the cement without any protection, as the connections of pipeline and the power cord may need maintenance or repair. Upon installation, the user shall guarantee that the connections of pipelines and the power cord are easy to maintain or repair. If the user installs the pipeline of the system as conceal pipe, any economic losses caused by the leakage of conceal pipe and other related reasons shall not be borne by our company.

If insulation is required, the full length of the solar hot and solar cold pipes MUST BE insulated.

There are many different kinds of water pipe insulation and many can be used on any type of pipe. When doing research to see what kind of insulation you will need you should consider the type of pipes you have, your homes age, and the climate in which you live in. You will use this information to pick an insulation that has the correct R-value for your needs. The R-value of a material is its ability to keep heat in or out of the water pipes. This value is based on several factors including the type of material plus its density and thickness. The higher the R-value the better of an insulator a material has been found to be. There are five major types of water pipe insulation that can be used on any type of pipe, each with its one unique advantages and disadvantages.

First, there is spiral wrap fiberglass insulation which is the cheapest of all the options but also has the lowest R-value of the group plus is the most labor intensive to install. Second, is foam tubing that can seal itself. This kind of foam pipe insulation has been

found to be extremely easy and quick to install since there is no tape needed. Once it is cut to the correct length and wrapped around the pipe, you simply remove the plastic strips to uncover the glue that seals the two sides together. There are various types and the more it cost the higher the R-value. Third, there is the foam tubing that is not self-adhesive. The major advantage of the non-self-sticking foam tubing is that you can find it in higher R-values, even though it does take some extra work to get it installed.

The fourth kind of water pipe insulation is pipe covers that are a fiberglass shell. This type of pipe cover differs from the other kind because they are hard fiberglass shells with a paper cover on the outside and inside a reflective foil lining. Like the foam tubing, they have a slit in one side that lets you wrap the water pipe and are self-sealing. They are especially good on higher pipes that reach greater temperatures, like steam pipes, where the additional heat levels can damage the foam tubing. While they are an option for cold water pipes, it would be better to just use them on the pipes with extremely hot temperatures and use a less expensive option on the cold water pipes. The fifth option is to cut to size standard fiberglass insulation like you would use in an attic and tape it around pipes. It is the best option for the insulation of your tank for hot water as well. In the end, to give your home the best possible water pipe insulation, you are going to need to use a variety of insulation materials depending on what the pipe is used for and where it is located.

No matter which kind of insulation you choose, it should meet the below requirements:

The insulation must:

1 Be of a closed cell type or equivalent, suitable for a solar water heating application and capable of withstanding the temperature of the water generated by the solar collectors under stagnation conditions.

2 The specification of the chosen insulation material should be checked with the insulation manufacturer prior to installation as different materials may vary in temperature tolerance.

3 The outdoor pipes should be insulated with R6.6 insulation with thickness at, or greater than, 1 inch. The indoor pipes should be insulated with R2.6 with thickness at least 1/4ò.

4 All pipe insulation exposed to sunlight must be protected from UV degradation. Use of pipe insulation jackets or a coating of exterior grade latex paint, or metal tape is recommended. Do not uses duct tape because it will quickly deteriorate when exposed to outdoor conditions. The drain plugs on the bottom of the collector should also be completely surrounded and covered by R-12 rubber insulation for freeze protection and better results.

The pipe shall be insulated after there is no leakage. Prepare the foam tube, and aluminum tape first. Then insulate the copper tube step by step.

5 be fitted up to and cover the connections on both the solar storage tank and the solar collectors.

Plumbing pipes should be well insulated with R2.6 material, and with minimum outside exposure length. It should be lined up through the attic and interior walls. However, in case it is hard to wire through interior walls, the pipes can run along an external wall and enter at the basement level.

All plumbing work must be carried out by a qualified person and the material of the collector loop shall conform to local authority requirements.

7. Commissioning the system

After the system installation, check there is no leakage in the system and follows the following steps to start up the system.

To fill and turn on the water heater:

Step 1: Connect Garden Pipe to Drain Valve V4, and keep V4 Open.
Step 2: Open the following valves: V0, V2, V4 and shut off the following valves: V1, V3, and V5
Step 3: Keep the water running for 5 minutes to flash out the solder or stains after the water from V4 is observed.
Step 4: Shut off V4 and Open V3, and the system is in normal operating status.

NOTE:

1.Please check all the valves are working well and the system is filled with water completely before putting the system operation.

2.Please install the thermostatic mixing valve to make sure the outlet temperature is lower than 50℃.

3.Please use the pipe connecting the T/P valve hole in order to escape the steam caused by high temperature and pressure of the system. In such a way that no damage is done to the system or any other materials in the building by the drained hot water. About the information on regular operation of safety valves, please see the user guideline in the packing of safety valves.

4.The system must be maintenance by a specialist in the certain period.

8. Troubleshooting

If you are having a problem with your unit, try the suggestions below. If the problem persists, please contact the specialist.

Problem	Possible solutions
Solar system leaking	Stop the system. Cut off V0 to stop the mains water into the system. Using V5 drain valve to drain all the water in the tank and then call for service immediately
Solar system low working performance	a) Less solar insolation in your geography area. Take use of other assistant energy sources, such as electric heating system or gas heating.
	b) Vacuum tube broken. Replace a new fine vacuum tube
	c) Heat pipe didnôt installation correctly. Pull out the heat pipe and daub some silicon grease on the heat pipeôs condenser then reinsert it into the manifold
	d) Pipe line does not seal and is no insulated very well, so there is more energy loss. Check and seal the pipe line and keep the pipeline insulated very well.
	e) A faulty heat pipe. Replace new fine heat pipe and contact Authorized service provider
Water releasing from T&P valve	It is normal working condition. Once some hot water or air is released from the T&P valve, the valve will be automatically closed shortly.
No hot water but air from tap when refill the system	There is air in the solar tank. Please keep air flowing out from tap until air disappearing

If there is an emergency, or you leave the solar system unattended and unused for long periods of time, please turn off V2 and V3, and open V1.

If after using this trouble-shooting guide and you still cannot solve the problem, please contact our Authorized SunMaxx service provider.

9. Maintenance requirements

9.1. Cleaning

Regular rain should keep the evacuated tubes clean, but if particularly dirty they may be washed with a soft cloth and warm, soapy water or glass cleaning solution. If the tubes are not easily and safety accessible, high pressure water spray is also effective.

9.2. Leaves

During autumn days, leaves may accumulate between or beneath the tubes. Please remove these leaves regularly to ensure optimal performance and to prevent a fire hazard.

9.3. Broken tube

If a tube is broken it should be replaced as soon as possible to maintain maximum collector performance. The system will still operate normally even with a tube broken. Any broken glass should be cleared away to prevent injury.

To replace a tube:

1. Remove the tube clip, slide broken tube out and carefully pick up any glass pieces. **Please wear protective gloves when handling the broken glass**. When removing the tubes, the rubber ring in the manifold casing may pop out. Just return the ring into place before inserting the new tube.
2. Avoid touching the glass wool insulation with bare hands, as it can cause mild skin irritation.
3. The new tubes should already have heat transfer fins inserted, so slide the new tube into place taking care to guide the heat pipe into the slot between the fin and the glass wall. Normally the heat pipe does not need to be removed from the manifold.

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10. Special conditional operation

1. If tank is not full, you can add water anytime, please add water after using hot water. If tank is exposed without water longer than 15 minutes, do not feed water, please make sure to add water in evening or next day morning, so it will protect the vacuum tubes from breaking for over large difference in temperature.

2. In order to avoid scalding, please turn on the cold water valve first, then turn on the hot water valve, then adjust the cold water valve and hot water until the suitable temperature of hot water is achieved, if the mixing valve is not available.

3. In areas which the water pressure is high, please turn down the filling water valve, so cold water can enter into the water tank slowly.

4. Collector should be mirror-like, or else it means tube is not in the vacuum condition. If it appears misty, please change the tube.

5. Air vent in the tank must not be jammed, in order to avoid swelling or breaking the tank.

6. Keep the tank full while winding.

7. In winter, keep the pipeline insulated to protect it from freezing in cold area and start the electrical cable installed on the inlet and outlet pipe.

8. Fixing the frame carefully against the strong wind and prevent from accident.

9. Please do not change the structure of the solar water heater at random.

10. The water temperature can be very high in the summer months and steam can be observed coming outer of the vent pipe. If the solar water heater is not in use in the summer or for a long period of time, it is advisable to cover the glass tubes with a canvas clothes a mat.

11. Other important information

1. Gaskets, sealants, and hoses are silicon rubber, not affected by fluids or environment.
2. Components exposed to public traffic are maintained below 140^{o}F. All other exposed areas over 140^{o}F are labeled with appropriate warning.
3. The solar system is installed on the roof. It will not impair building enclosure function.
4. It is better not to allow vermin intrusion during the system service period.
5. Installation provisions have to meet applicable codes and National Roofing Contractors Assoc. practices.
6. All components shall accessible for maintenance and servicing after installing.

12. Warranty Card

Upon installation of the solar system, the dealer responsible for the sale will fill out the warranty card and the customer will complete a record of it and retain it for future servicing.

This limited warranty covers the glass tubes, hot water tank and tank support frame for tube-breakage, leakage or any other malfunction caused by defects in the materials and/or workmanship. It extends to the first buyer and to any subsequent owner as long as the water heater has been installed by trained and qualified authorized technicians approved by the local dealer.

On glass tubes the limited warranty is for a period of 5 years from the date of purchase. This warranty excludes loss of vacuum in a tube or tubes due to breakage during transport, handing or after installation. A gradual reduction in vacuum levels over time is normal and accordingly is not a defect in terms of this warranty.

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The limited warranty on the hot water tank and support frame is for a total period of 3 years from the date of purchase.

This warranty also does not cover:

- Cover leakage or breakage of tubes or other malfunctions caused by defective installation, misuse, operation and maintenance contrary to the written instructions in the user manual.
- Odiferous, discolored or rusty water coming from the system.
- Damage to surrounding area or property caused by leakage or malfunction of the system.
- Costs associated with the replacement and repair of the unit, including freight, shipping or delivery charges, removal, installation or re-installation charges;

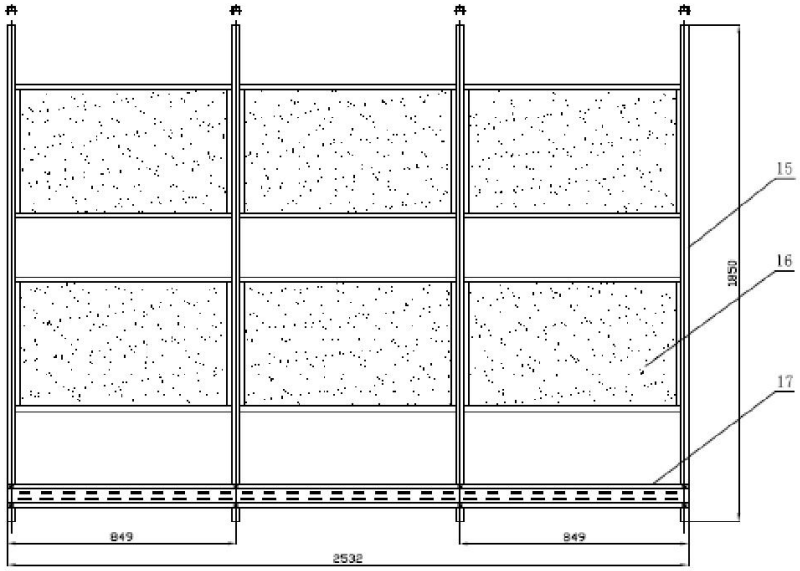
any material, and permits required for installation, re-installation or repair. All legal disputes are to be settled according to the rules of ICC (International Court of Arbitration).

To facilitate warranty service, you should:

- Follow all instructions enclosed with the product.
- Retain all bills of sale or receipts for proof of installation. Etc.
- Contact your installer or dealer as soon as any problem or defect is notices.
- When necessary, allow our chosen representative, to inspect the unit.

ANNEX 1.Components List

Information Of Components List To Be Delivered			
No.	Part No.	Item	Quantity
1	1	Evacuated tube with	30
2	7	Tank	1
3	\	T.P. relief valve	1
4	\	Automatic air vent	1
5	6	Sealing gasket	30
6	5	Heat pipe screw	30
7	8	Tank support	4
8	9	Acclivitous support	4
9	10	Back leg	2
10	11	Inclined support	4
11	12	Horizontal support	4
12	13	Iron feet	8
13	14	Adjusted end cap	30
14	15	Front leg	4
15	16	Reflected flat	6
16	17	End bracket	1
17	18	Bridging	6
18	19	Middle back leg	4
19	\	Valve and notice Labels	7
The part No. in this table shall be refer to the No. in the below drawing.			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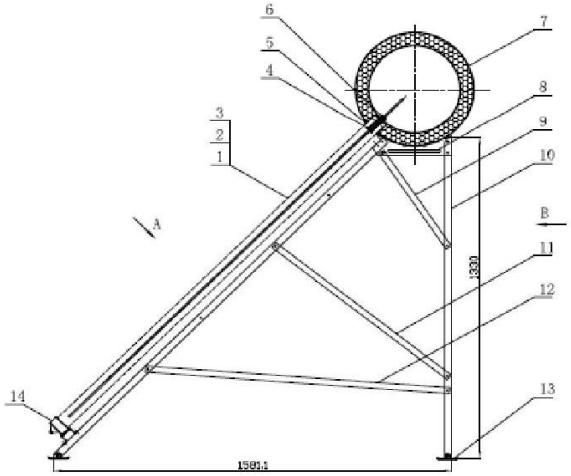
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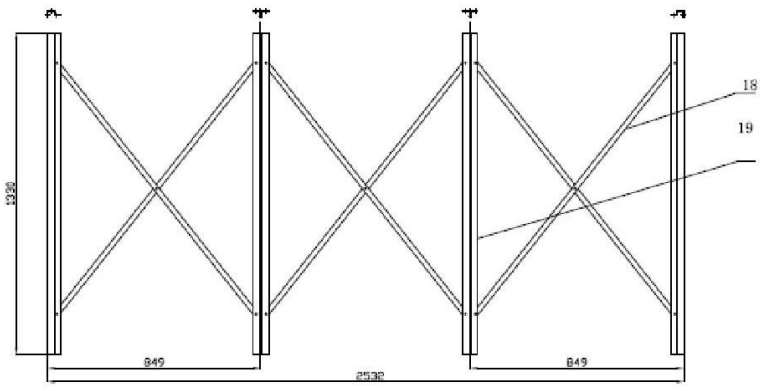
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THERMOPOWER-VTS30HP SOLAR WATER HEATER SYSTEM FRAME DRAWING

Component For Plumbing System Need The Installer Buy Them From Home Depot Or Plumbing Stores separately.			
No.	Part No.	Item	Quantity
20	\	Ball valve 3/4ôô	3
21	\	Non-return valve	1
22	\	Drain valve 3/4ôô	2
23	\	Copper Pipe 3/4ôô	The length determined by the actual layout
24	\	Temperature monitor	1
25	\	TEE Coupling 3/4ôô	Per the actual install conditions
26	\	Pipe insulation 2ôô	Per the actual install conditions
27	\	Pipe insulation 3/4ôô	Per the actual install conditions
28	\	PVC pipe 4ôô	Per the actual install conditions
29	\	Mixing valve	1
30	\	Back up water heater*	1

* Back up water heater shall have adequate capacity, listed and labeled by an accredited listing organization.

The recommended option is AO Smith GVR-50 gas water heater or AO Smith ECS-50 electric water heater. Consumer are free to choose any other 50 gal gas or electric water heaters with R-value equal or greater than 16, and volume is within 10% of 50 gallon.

ANNEX 2 Notice Label

Hot warning label

DANGER
HOT
BURN
Water temperature over 125 F can cause severe burns instantly or death from scalds.
Children, disabled and elderly are at highest risk of being scalded.
See instruction manual before setting temperature at water heater.
Feel water before bathing or showering.
Temperature limiting valves are available, see manual.
Une température de l'eau plus supérieure à 51°C peut causer des brûlures instantanées graves ou entraîner la mort.
Les enfants, les personnes handicapées et les personnes âgées courent plus de risques d'être ébouillantées.
Voir la notice avant de régler la température du chauffe-eau.
Vérifier la température de l'eau avec la main avant de prendre un bain ou une douche.
Des limiteurs sont offerts, voir la notice.

Freeze protection label

Freeze Protection Information

The freeze protection method of this system is thermal mass and manual draining. Drain the system as instructed in the ownerôs manual when temperatures of 14^{o}F or below are expected.

System Label

Pressurized solar water heater with heat pipe Type:
ThermoPower-VTS30HP

Aperture area: 2.84 m^2

Nominal capacity of the storage vessel: 63 gal Max.
Operating Pressure: 87 psi

Max. Operating Temperature: 194^{o}F

Collector transfer medium: water/antifreeze, no toxic fluid (If applicable, manual draining is recommended.)

Trace number: Q5110706-051

Electrical power of all electric components: disable Manufacturing date: 2011

Manufacture: SunMaxx Solar ^{tm}

Pressurized solar water heater with heat pipe and electrical element backup Type:
ThermoPower-VTS30HP-E

Aperture area: 2.84 m^2

Nominal capacity of the storage vessel: 63 gal Max.
Operating Pressure: 87 psi

Max. Operating Temperature: 194^{o}F

Collector transfer medium: water/antifreeze, no toxic fluid (If applicable, manual draining is recommended.)

Trace number: Q5110706-051 Manufacturing date: 2011 Manufacture: SunMaxx Solar ^{tm}